

L Number	Hits	Search Text	DB	Time stamp
1	288	345/345/209.ccls. or 345/96.ccls.	USPAT	2004/03/02 13:27
2	9417	345/87-103.ccls. or 345/208-210.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2004/03/02 13:28
3	2726	(345/87-103.ccls. or 345/208-210.ccls.) and polarit\$3	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2004/03/02 14:32
4	452	(ferroelectric\$ or ferro-electric\$3) NEAR2 (liquid NEAR2 crystal or lc) SAME asymmetric	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2004/03/02 14:25
5	11	((345/87-103.ccls. or 345/208-210.ccls.) and polarit\$3) and ((ferroelectric\$ or ferro-electric\$3) NEAR2 (liquid NEAR2 crystal or lc) SAME asymmetric)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2004/03/02 14:25
6	1216	(345/87-103.ccls. or 345/208-210.ccls.) and (revers\$3 or invers\$3) NEAR2 (polarit\$3 or positive or negative)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2004/03/02 14:33
7	7	((ferroelectric\$ or ferro-electric\$3) NEAR2 (liquid NEAR2 crystal or lc) SAME asymmetric) and ((345/87-103.ccls. or 345/208-210.ccls.) and (revers\$3 or invers\$3) NEAR2 (polarit\$3 or positive or negative))	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2004/03/02 14:34

INPUT DEVICE

BACKGROUND OF THE INVENTION

This invention relates to an input device for use with a display device such as a cathode ray tube (CRT) as a computer terminal, and more particularly to a touch panel at which it is pressed by a touch pen or the like is detected.

Various systems have been proposed so far for this type of input devices, for example, an electrode contact type in which membrane switches are contained, a photo matrix type wherein a light source and a photosensor are used in combination such that a coordinate of an obstacle on a light path may be detected thereby, a pressure type wherein pressure by touch is detected, and a surface elastic wave type wherein a coordinate is detected by a propagation time of a surface wave along a panel surface. Among these types of systems, the electrode contact type is simpler in construction and is reduced in cost comparing with the remaining types. However, a coordinate input device of the conventional type includes therein a keyboard

switches of a membrane type which employs a transparent plastic film which has evaporated or sputtered thereon a membrane of a metal material such as Ag, Pd and so on, or a membrane of a metal oxide such as In_2O_3 and so on over a predetermined area. Accordingly, an input device of this type is disadvantageous in that it has a relatively high resistance and a rather low mechanical strength so that the available percentage becomes low and the life becomes short. Further, some membrane electrodes have fine powder of conductive metal material dispersed in a synthetic resin material. But, dispersion of such metal powder is not always uniform, and hence, accurate detection of coordinates is sometimes obstructed and satisfactory strength cannot be attained.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide an input device which is simple in construction, can be produced at a low cost, has a high mechanical strength and durability, and can assure accurate detection of coordinates.

According to the present invention, there is provided an input device, comprising: an insulator sheet; a resistor layer formed uniformly on said insulator sheet; a plurality of terminal leads connected to opposite ends of said resistor layer; an elastic, flexible insulator spacer on said resistor layer having a conductive element embedded therein; and an insulator protective sheet mounted in overlapping relationship to cover said insulator spacer; a position in coordinates being detected from a potential associated with a position of contact between said conductive element and said resistor layer.

Other objects, features and advantages of the present invention will become apparent to those skilled in the art from a reading of the following detailed description of a preferred embodiment, taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of an input device according to the present invention, with a part thereof omitted;

FIG. 2 is a cross sectional view of part of the input device; FIG. 3 is a similar cross sectional view of part of the input device in a partially depressed condition; and FIG. 4 is a partly fragmentary perspective view showing the entirety of the input device.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. 1, there is shown a plan view of an embodiment of an input device of the present invention with upper insulator spacer and insulator protective sheet removed therefrom.

The embodiment is constructed as an input device for a two coordinate display device of the type wherein coordinates in directions along the X and Y axes are detected. The input device includes an insulator sheet 1 substantially of a regular square configuration to which is applied a resistor layer 2 of a conductive paint which is made by suitably mixing carbon and any other conductive material or materials. Opposite ends of the resistor layer 2 in the direction along the X axis and also in the direction along the Y axis are connected to a plurality of terminal leads 4 which are provided at terminal leading portions 3 of the insulator sheet 1. The terminal leads 4 are arranged in equally spaced relationship in the directions along the X and Y axes, and a fixed voltage is applied across opposite ones of the terminal leads 4 in each of the directions along the X and Y axes. The terminal leads 4 are individually connected to diodes 5 to define directions of flows of electric currents in the directions along the X and Y axes.

Referring now to FIG. 2 which is a sectional view of the embodiment of the invention, the resistor 2 has mounted on a rigid substrate 6 in which the resistor 2 is placed thereon an insulator 8 in which a conductive member 7 is constituted from a grid of thin or fine gauze, knit into the form of a grid, either of thin or fine wires of copper or bronze plated with gold or of thin wires of a good conductive metal material which are coated with a carbon paint of a low resistance. Preferably, the diameter of wires is between 0.05 to 0.2 mm and the distance between adjacent wires, which extend in parallel relationship, is smaller than the distance between adjacent terminal leads 4. The insulator 8 is made of an elastic and flexible material containing foams therein, such as a foamed silicon material. In a normal position not depressed, the insulator 8 retains the conductive member 7 in a plane therewithin to isolate the conductive member 7 from upper and lower surfaces thereof, but when depressed, it will be readily deformed to expose the conductive member 7 from the lower surface thereof. Opposite ends of individual thin wires of the gauze extend externally from opposite end faces of the insulator spacer 8 and are electrically connected to one end of a circuit including the resistor 8 is covered with a flexible insulator protective sheet 9 made of a polyurethane material.

In the input device of such a construction as described above, it is understood that a predetermined voltage is applied between the opposing terminal leads 4 in the direction along the X axis as in FIG. 1. In this condition, if the insulator protective sheet 9 is depressed at a point thereon by a pressing member 10 which has a